Assessment of State-Level Fugitive Emissions Programs in Comparison to EPA NSPS

December 8, 2017

Dr. Renee McVay, PhD
Research Analyst, Oil & Gas
Environmental Defense Fund
301 Congress Avenue, Suite 1300
Austin, TX 7870

Hillary Hull, MS
Manager, Research & Analytics
Environmental Defense Fund
123 Mission St, 28th Floor
San Francisco, CA 94105

This report addresses and responds to EPA's claims in its proposed rule and notice of data availability, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources: Stay of Certain Requirements, 82 Fed. Reg. 51788 (November 8, 2017) ("NODA") with regard to the relative efficacy of state-level fugitive emissions programs as compared to EPA's NSPS, Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources, 81 Fed. Reg. 35824 (June 3, 2016) ("NSPS"). EPA claims that,

While not all states have fugitive emissions programs, considering that many states with high oil and gas production do have such programs in place, it is not clear that the marginal additional emission reductions achieved during the EPA's reconsideration process outweigh the potential disruption to existing state programs and company-specific programs.

EPA cites California, Colorado, North Dakota, Ohio, Pennsylvania, Texas, Utah, and Wyoming as states that have their own fugitive emissions programs.ⁱⁱ

EPA's suggestion that these states' LDAR programs render a stay of the national program insignificant is devoid of any analysis and misrepresents the emissions reductions achievable by each state's program, as it ignores many differences between the fugitive emissions programs in these states, including scope and coverage of facilities and segments, threshold emissions detection requirements, timeframe for repairing leaks, and other provisions of each program. Many of these state programs' fugitive emissions requirements are significantly less rigorous than EPA's NSPS, and thus achieve fewer benefits.

In the following tables, we have compared the scope and requirements of each state program. The data clearly indicates that many of these programs do not achieve the emissions reductions that the NSPS does within each state, respectively. The existence of these state programs does not support a stay of the NSPS. Moreover, the assessment below is conservative, as it does not account for other major oil and gas producing states that EPA did not cite, such as New Mexico and Montana, which do not have fugitive emission programs.

Exhibit 1 below illustrates the relative coverage of state LDAR programs as percentages of the wells covered under the NSPS. Combined, the states that EPA has identified as having fugitive emission programs that limit the NSPS's benefits cover only 34% of the wells covered by the NSPS. Moreover, even for the sources that are subject to some state programs, those programs vary in stringency and may not secure the same level of reductions as EPA standards. For instance, Pennsylvania provisions are not mandatory and only require annual inspections—far weaker than the NSPS standards.

¹82 Fed. Reg. 51788, 51791.

ii Id

NSPS WELLS COVERED BY STATE LDAR STANDARDS Number of Wells 0 5.000 10,000 15,000 20,000 25,000 30,000 CA 100% CO 100% ND 0% OH **76%** PΑ ■ 81% TX 5% UT 1 43% WY 8% Total US 34% ■ Wells covered by state LDAR standards and NSPS ■ Wells covered only by NSPS

Exhibit 1. NSPS Wells Covered by State LDAR Standards

Major provisions indicating state programs attain insufficient emissions reductions to achieve parity with the NSPS include the following:

- One state cited by EPA, North Dakota, does not have a fugitive emissions program for well sites
 at all. North Dakota's fugitive emissions program covers only pipelines and underground storage
 facilities. Therefore none of the wells in North Dakota that are covered by the NSPS will be
 covered by a state standard during a stay of the NSPS.
- In Texas, the LDAR requirement only applies to wells with very high uncontrolled emissions (>10 or 25 tons per year (tpy), an estimated 5% of the NSPS covered wells (and as few as 0.5%).

 Because Texas has a very large number of additional wells that would be covered by the NSPS, the emissions reductions lost during an NSPS Stay would be substantial.
- Wyoming's fugitive emission program is specific to the state's ozone non-attainment area and
 thus is not state-wide. Furthermore, only wells within the nonattainment area with fugitive
 volatile organic compound (VOC) emissions above 4 tpy are covered. Therefore, less than 10%
 of the original covered wells would be covered by a state rule during a stay of the NSPS.
- Utah's program applies only to new sources, and does not cover the modified sources covered
 under the NSPS. Of those facilities, only sites with throughput equal to or greater than 10,000
 barrels per year are covered by the standards, leaving out well over half of the wells covered by
 the NSPS.
- In Ohio, Utah, and Texas, provisions allow for inspection frequency to decrease based on the percentage of components leaking. This reduction in inspection frequency would decrease the inspection frequency below what the NSPS requires and would therefore lead to less emission reductions than the NSPS would achieve.
- In Colorado, inspection frequency at well sites depends on estimated tank emissions, with some categories requiring less frequent inspections than the semiannual inspections for well sites

- required under the NSPS. Sources in these categories would be inspected less frequently and would therefore have fewer emissions reductions during a stay of the NSPS.
- In Pennsylvania, operators can choose to seek a permit exemption if their facility emits below specified levels and implements certain emission controls including conducting leak detection and repair. The provisions only require annual inspections, which will lead to fewer emission reductions than the semiannual inspections required by the NSPS, although proposed regulations may increase this frequency. Furthermore, only unconventional wells are covered, neglecting emissions from conventional wells.
- California has a higher emission threshold for repair than the NSPS, so leaks that necessitate
 repair under the NSPS may continue to emit under this state standard if the NSPS is stayed. In
 Texas, the emission threshold for repair for certain combinations of distance from sensitive
 receptors and potential to emit is higher than the NSPS.

The following tables compare each state program to the EPA NSPS for program aspects including supply chain segment and facilities covered, coverage of new and existing facilities, percentage of wells covered by each state program that are covered by the NSPS, thresholds before leak detection is required, threshold emission levels before repair is required, and frequency of surveys required.

TABLE 1. SUPPLY CHAIN SEGMENT

EPA NSPS: WELL SITES, COMPRESSOR STATIONS, NATURAL GAS PROCESSING PLANTS¹

CA ²	 (1) ONSHORE & OFFSHORE CRUDE OIL OR NG PRODUCTION (2) CRUDE OIL, CONDENSATE, AND PRODUCED WATER SEPARATION AND STORAGE (3) NG UNDERGROUND STORAGE (4) NG GATHERING AND BOOSTING STATIONS (5) NG PROCESSING PLANTS (6) NG TRANSMISSION COMPRESSOR STATIONS
CO ³	OIL AND GAS EXPLORATION AND PRODUCTION OPERATIONS, WELL PRODUCTION FACILITIES, NATURAL GAS COMPRESSOR STATIONS, AND NATURAL GAS PROCESSING PLANTS
ND ⁴	UNDERGROUND GATHERING PIPELINES; UNDERGROUND CARBON DIOXIDE STORAGE FACILITIES; TREATING PLANTS; NO WELL PRODUCTION SITES!
OH ⁵	UNCONVENTIONAL, HORIZONTAL, NON-TITLE V WELL SITES; GATHERING AND BOOSTING COMPRESSOR STATIONS
PA ⁶	NATURAL GAS GATHERING AND BOOSTING STATIONS; UNCONVENTIONAL WELL SITES WHOSE OVERALL VOC EMISSIONS REMAIN BELOW 2.7 TPY; ADDITIONAL MEASURES PROPOSED FOR UNCONVENTIONAL WELL SITES, REMOTE PIGGING STATIONS, NG COMPRESSION STATIONS, PROCESSING PLANTS, AND TRANSMISSION STATIONS
TX ⁷	(1) PETROLEUM REFINERIES; NATURAL GAS PROCESSING PLANTS IN OZONE NON-ATTAINMENT AREAS; (2) OIL AND GAS PRODUCTION AND PROCESSING SITES WITH THE POTENTIAL TO EMIT AT LEAST 10 OR 25 TPY OF UNCONTROLLED VOCS (DEPENDING ON DISTANCE FROM SENSITIVE RECEPTOR)
UT ⁸	WELL SITES; TANK BATTERIES
WY ⁹	OIL AND GAS EXPLORATION OR PRODUCTION WELL

TABLE 2. SCOPE

EPA NSPS: NEW AND MODIFIED SOURCES (RELATIVE TO SEPTEMBER 18, 2015)

CA ²	NEW AND EXISTING
CO ₃	NEW AND EXISTING
ND^4	NEW AND EXISTING
OH ⁵	NEW AND MODIFIED (RELATIVE TO APRIL 4, 2014)
PA ⁶	NEW AND MODIFIED (RELATIVE TO AUGUST 10, 2013)
TX ⁷	NEW
UT ⁸	NEW (RELATIVE TO JUNE 5, 2014)
WY ⁹	NEW,MODIFIED, AND EXISTING SOURCES IN UPPER GREEN RIVER BASIN OR THE JONAH AND PINEDALE ANTICLINE DEVELOPMENT AREA AND NORMALLY PRESSURED LANCE

TABLE 3. PERCENT COVERAGE BY STATE RULE OF WELL SITES THAT ARE COVERED BY 2016 NSPS RULE

WELLS COVERED BY NSPS: 26,013 WELLS CA^2 100% CO^3 100% ND⁴ 0% OH⁵ 76% PA⁶ 81% TX⁷ UP TO 5% (OR AS LITTLE AS 0.5%) UT⁸ 43% WY⁹ 8%

Methodology for calculating the percent coverage by state rule of well sites covered by 2016 NSPS Rule

The original wells that would be covered by the NSPS were identified using data from DrillingInfo, a proprietary database that compiles a wide range of drilling- and production-related information from state oil and gas commissions. New and modified wells relative to September 18, 2015 are covered by the 2016 NSPS. New wells were identified as those with a spud date on or after September 18, 2015 and those with a missing spud date but with a first production date on or after September 18, 2015 (first production is reported by month so the formula conservatively uses October 1, 2015). Modified wells were selected as those with a completion date on or after September 18, 2015. Out of the set of 26,013 wells, the respective state regulations and permitting programs were applied to determine how many wells would still be covered by an LDAR program during a stay of the NSPS.

California and Colorado LDAR standards cover new and existing wells without any throughput or emission thresholds, so 100% of the NSPS wells in California and Colorado would be covered under state standards, if the NSPS were stayed.

North Dakota LDAR regulations do not apply to well sites, so 0% of the NSPS wells in North Dakota would still be covered.

The Ohio permit requiring LDAR covers unconventional, horizontal, non-Title V well sites that are new and modified relative to April 4, 2014. This date is prior to the NSPS cut-off date, so no wells are excluded based on date. DrillingInfo does indicate whether a well is horizontal but does not indicate whether it is unconventional (for Ohio). Therefore, to be conservative, all horizontal wells in Ohio were assumed to be unconventional and therefore to qualify for the state permit requiring LDAR. The resulting 76% of NSPS wells covered under state standards is therefore an upper bound, as some horizontal wells may be conventional and would therefore not qualify for this permit (and thus for LDAR requirements).

Pennsylvania's current non-mandatory permit exemption program provides an exemption for operators who conduct leak detection and repair. The LDAR program covers unconventional well sites whose overall VOC emissions remain below 2.7 tpy that are new and modified relative to August 10, 2013. Again, this date is prior to the NSPS date, so no wells are excluded based on date. DrillingInfo does indicate in Pennsylvania whether a well is unconventional, so the original NSPS wells in Pennsylvania were filtered using this criteria. To be conservative, it was assumed that all unconventional wells in Pennsylvania have emissions below 2.7 tpy. This assumption is reasonable because many sources are excluded from contributing to the 2.7 tpy threshold (e.g., well drilling, completion and work-over activities and other sources meeting the exemption criteria). Our estimate that 81% of wells covered by the NSPS are included in Pennsylvania's program is likely an upper bound, both because it is a voluntary program, and because some unconventional wells may have higher emissions and would not qualify for this permit exemption.

Texas LDAR requirements only apply to wells required to apply for the Standard Permit, which is based on uncontrolled VOC emissions (>10 or 25 tpy) and distance from a sensitive receptor, such as a home or school. The 10 tpy VOC threshold was converted to a gas volume.³ This is conservative, as it was assumed that the lower threshold was applicable rather than a combination of the lower and upper thresholds. The total affected NSPS wells were filtered to generate a list of new wells in Texas only. The annual gas production of each well was multiplied by 3% as an estimated leak rate per well. This leak rate is also conservative, as it represents the higher end of leak rates in the state.⁴ The leak rate volumes for each well were compared to the threshold volume to estimate the number of new wells in Texas that would be subject to the state permit.⁵

³ Assumed a conversion ratio of 3.6 CH4/VOC, per EPA assumptions. Then applied the density of methane to the mass in order to find the methane volume. Assumed a 78.8% volume of methane in gas to convert to a gas volume.

⁴ The 3% leak rate is conservatively high and results in a conservatively high estimate of covered wells. The leak rate in the Barnett Shale was found to be about 1.5% (ranging from 1.2% to 1.9%). Zavala-Araiza et al, *Reconciling divergent estimates of oil and gas methane emissions*, 2015, available at http://www.pnas.org/content/112/51/15597.full.pdf.

⁵ We also utilized the Texas Commission on Environmental Quality (TCEQ) permit database for New Source Review Air Permits (http://www2.tceq.texas.gov/airperm/index.cfm?fuseaction=airpermits.start) to estimate wells in Texas subject to LDAR requirements under the Standard Permit. A search query was set up for Standard Permits for Oil and Gas Production Facilities with project completion dates after September 18, 2015 (the date at which the NSPS would apply to new and modified wells). The permit database does not consistently specify which permits are for wells and which are for

Utah rules cover new wells relative to June 5, 2014 (again, this date is prior to the NSPS date). LDAR is only required for sources with "a projected annual throughput of crude oil and condensate combined that is greater than or equal to 10,000 barrels." DrillingInfo does not provide a way to estimate projected throughput. Therefore, average annual throughput was used instead. Cumulative oil was divided by the number of months producing, and this average monthly throughput was multiplied by 12 in order to calculate average annual throughput. If this value was greater than 10,000 barrels, LDAR was assumed to apply to this well.

Wyoming rules apply to new, modified, and existing sources (relative to 2013) in the Upper Green River Basin (UGRB) or the Jonah and Pinedale Anticline Development Area and Normally Pressured Lance (JPAD/NPL) with fugitive emissions greater than or equal to 4 tpy of VOCs The NSPS wells in Wyoming were first filtered based on counties within the UGRB or the JPAD/NPL, yielding 503 wells. To determine how many of these wells would have fugitive emissions greater than or equal to 4 tpy, an analysis was completed of permits issued in the UGRB, which list fugitive emissions. Of a sample of 386 permits issued for the UGBR, 16% had fugitive emissions greater than or equal to 4 tpy VOC. This 16% was assumed to apply to the 503 wells out of the NSPS wells, leading to 80 wells covered by Wyoming LDAR rules, or 8% of the NSPS wells.

other processing facilities such as gas plants or compressor stations. Some permits are specified as "well sites" while others are merely labeled as the standard permit. Given the constraints of the timeline for the comment period, we were unable to review each individual permit to determine if it applied to a well site. However, assuming all permits not specifying "well sites" were for compressor stations or processing plants, we concluded that the percentage of affected wells could be as low as 0.5%.

TABLE 4. THRESHOLD FOR INSPECTION

EPA NSPS: NONE		,
CA ²	NONE	
CO ³	NONE	
ND^4	NONE	
OH⁵	NONE	
PA ⁶	NONE	
TX ⁷	PRODUCTION FACILITY: VOC EMISSIONS GREATER THAN 10 TPY OR 25 TPY, DEPENDING ON DISTANCE FROM SENSITIVE RECEPTOR	
UT ⁸	PROJECTED ANNUAL THROUGHPUT OF CRUDE OIL AND CONDENSATE COMBINED THAT IS GREATER THAN OR EQUAL TO 10,000 BARRELS.	
WY ⁹	FUGITIVE EMISSIONS ARE GREATER THAN OR EQUAL TO 4 TPY OF VOCS.	

TABLE 5. THRESHOLD FOR REPAIR

EPA NSPS: 500 PPM REPAIR THRESHOLD IF USING METHOD 21.

CA ²	1,000 PPM TOTAL HYDROCARBON LEAK THRESHOLD WHEN FULLY IMPLEMENTED.
CA	1,000 FFINI TOTAL HTDROCARBON LEAK THRESHOLD WHEN FOLLT IMPLEINENTED.
CO ₃	500 PPM LEAK THRESHOLD (NEW) AND 2,000 PPM (EXISTING COMPRESSOR STATIONS), IF USE METHOD 21.
ND^4	NONE
OH⁵	10,000 PPM FOR ALL COMPONENTS EXCEPT COMPRESSOR AND CLOSED VENT SYSTEM (500 PM), IF USE ANALYZER
PA ⁶	2.5% METHANE USING A GAS LEAK DETECTOR AND A VOC CONCENTRATION OF 500 PPM
TX ⁷	THRESHOLD FOR PRODUCTION FACILITY DEPENDS ON COMPONENT, DISTANCE FROM SENSITIVE RECEPTOR AND EMISSION THRESHOLD: 500 PPMV VOC, 2,000 PPMV OR 10,000 PPMV
UT ⁸	500 PPM OR GREATER WITH AN ANALYZER OR A TUNED DIODE LASER ABSORPTION SPECTROSCOPY (TDLAS) ANALYZER.
WY ⁹	NONE

TABLE 6. FREQUENCY

EPA NSPS: INITIAL SURVEY WITHIN 60 DAYS OF STARTUP OR MODIFICATION SEMI-ANNUAL FOR WELL SITES; QUARTERLY INSPECTIONS FOR COMPRESSOR STATIONS

CA² QUARTERLY

INSPECTION FREQUENCY DEPENDS ON ACTUAL FUGITIVE VOC TON PER YEAR EMISSIONS FOR COMPRESSOR STATIONS:

COMPRESSOR STATIONS:

0-12: ANNUAL

13-50: QUARTERLY

OVER 50: MONTHLY

INSPECTION FREQUENCY DEPENDS ON ACTUAL UNCONTROLLED VOC EMISSIONS FROM STORAGE TANKS OR FACILITY, IF NO TANKS,

CO³ AT WELL SITES

WELL SITES:

0-6: ONE-TIME

7-12: ANNUAL

13-50: QUARTERLY

50 AND ABOVE: MONTHLY

MULTI-WELL SITES > 20 WITHOUT TANKS: MONTHLY

ND⁴ N/A

OH⁵

INITIAL INSPECTION WITHIN 90 DAYS OF STARTUP; QUARTERLY INSPECTIONS FOR NEXT 4 QUARTERS; STEP DOWN TO SEMI-ANNUAL AFTER 4 CONSECUTIVE QUARTERS WITH NO MORE THAN 2% OF COMPONENTS LEAKING; STEP DOWN TO ANNUAL AFTER 2

CONSECUTIVE SEMI-ANNUAL INSPECTIONS IF NO MORE THAN 2% OF COMPONENTS LEAKING; STEP UP TO ORIGINAL QUARTERLY

INSPECTIONS WHENEVER 2% OF MORE OF COMPONENTS ARE LEAKING

PA⁶ ANNUAL INSPECTION FOR UNCONVENTIONAL WELL SITES; QUARTERLY INSPECTIONS FOR G&B STATIONS

TX⁷ QUARTERLY WITH POSSIBILITY TO REDUCE TO SEMI-ANNUAL OR ANNUAL IF CERTAIN CONDITIONS ARE MET

QUARTERLY INSPECTIONS FOR NEW WELL SITES/TANK BATTERIES WITH A PROJECTED ANNUAL CRUDE OIL OR CONDENSATE COMBINED THROUGHPUT OF >25,000 BARRELS. POTENTIAL TO REDUCE FREQUENCY TO SEMI-ANNUAL IF NO LEAKS DETECTED AFTER 1 YEAR AND TO ANNUAL IF NO LEAKS DETECTED FOR 2 YEARS.

UT⁸

ANNUAL INSPECTIONS AT FACILITIES WITHOUT TANKS AND THOSE WITH LESS THAN 25,000 COMBINED ANNUAL CRUDE AND CONDENSATE THROUGHPUT.

WY9

QUARTERLY

References

- 1. EPA, Final NSPS Oil and Natural Gas Sector: Emission Standards for New and Modified Sources, available at https://www3.epa.gov/airquality/oilandgas/may2016/nsps-finalrule.pdf.
- 17 C.C.R. Section 95665 et seq (7-17-2017), available at https://govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I401BB8146DA14B519A991D7827913AE E&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)
- 3. Colorado Air Quality Control Commission, 5 C.C.R. 1001-9, CO Reg. 7 § XVII, XVIII (Feb. 24, 2014).
- 4. North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division, Rules and Regulations. Available at https://www.dmr.nd.gov/oilgas/rules/rulebook.pdf
- 5. Ohio EPA General Permit 12.1 and 12.2, available at http://epa.ohio.gov/dapc/genpermit/oilandgaswellsiteproduction.aspx; Ohio GPs for compressor stations, available at http://epa.ohio.gov/dapc/genpermit/ngcs.aspx
- 6. PA GP-05, Natural Gas Compression Facilities, available at http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-9747;

 Department of Environmental Protection, Air Quality Permit Exemption 38, available at http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-96215/275-2101-003.pdf; PA DEP Draft GP 5 and 5A available at http://www.elibrary.dep.state.pa.us/dsweb/Get/Document-116053/2700-PM-BAQ0268_GP-5%20.pdf
- 7. Texas Administrative Code Title 30, Part 1, Chapter 115, Subchapter D, Division 2 and 3; available at http://texreg.sos.state.tx.us/public/readtac%24ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=115&sch=D&div=2&rl=Y

- 8. Utah GAO, available at https://deq.utah.gov/Permits/GAOs/docs/2014/6June/DAQE-AN149250001-14.pdf; U.A.C. §§ 307-501 to 307-504.
- 9. WDEQ, Oil and Gas Production Facilities Ch. 6, Section 2 Permitting Guidance for the UGRB (2016), available at http://deq.wyoming.gov/media/attachments/Air%20Quality/New%20Source%20Review/Guidance%20Documents/5-12-2016%20Oil%20and%20Gas%20Guidance.pdf; WDEQ, Air Quality Division Rules, Chapter 8, section 6 (May 19, 2015).